Page 1, beginning at line 15, to page 2, line 3, please replace the paragraph as follows:

Fuel assemblies consumed and no longer usable in a terminal stage of fuel cycle are called spent fuels. Spent fuels contain fission products and other highly radioactive substances, and must be cooled thermally, and hence they are cooled for a specific period in a cooling pit at a nuclear power plant. Then they are transferred into a shielding container called cask, and conveyed and stored at reprocessing plant or storage facility by means of truck or ship. When transferring the spent fuel assemblies into the cask, a holding element having a lattice section called basket is used. Each one of the spent fuel assemblies is put into each of the cells formed as a plurality of storing spaces in the basket, and a proper holding strength to withstand vibration during transportation is assured.

Page 3, beginning at line 6, please replace the paragraph as follows:

The square pipes 510 are made of aluminum alloy mixing neutron absorbing material (boron: B) so that the inserted spent fuel assemblies may not reach a critical condition. At both sides of the cask main body 512, moreover, a trunnion 513(only one is shown) for suspending the cask 500. At both ends of the cask main body 512, a buffer materials 514 assembling wood or other shock-absorbing materials are provided (only one side is shown). Reference numeral 515 is a cell for accommodating the spent fuel assemblies.

Page 3, beginning at line 24, to page 4, line 9, please replace the paragraph as follows:

The fuel assembly 600 has 8 x 8 fuel rods 603 arranged in lattice. Each fuel rod 603 is a long bar of about 4 meters in length. A support lattice 607 is provided for supporting the fuel rod 603. In each fuel rod 603, a plurality of columnar pellets 631 formed by sintering powder of uranium oxide are inserted as fuel into a cylindrical clad pipe 633 composed of zirconium alloy, and held by a spring 632 inserted in the upper part of the clad pipe 633. A

a4 cncld

handle 610 is used for lifting up and down the fuel assembly 600. The spent fuel assembly inserted in the cell 515 in this cask 500 is a fuel assembly for BWR 600 shown in Fig. 15.

Page 4, beginning at line 10, please replace the paragraph as follows:

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By contrast, the fuel assembly shown in Fig. 16 is used in PWR. In this fuel assembly for PWR 700 , control rods 708 are properly distributed among fuel rods 703, and the fuel rods 703 and control rods 708 are arranged in a 17 x 17 lattice form. In this 17 x 17 fuel assembly 700, one measuring pipe is disposed in the center, and 24 control rods 708 are distributed.

Page 4, beginning at line 17, please replace the paragraph as follows:

a6

The reactivity of the core can be controlled by moving the control rod 708 up or down. Each fuel rod 703 is a long bar of about 4 meters which is same as the fuel rod 603 for BWR, and hence a support lattice 707 for supporting the fuel rod 703 is provided. In each fuel rod 703, a plurality of pellets 731 are inserted into a cylindrical clad pipe 733 composed of zirconium alloy, and held by a spring 732 inserted in the upper part of the clad pipe 733. In this cask, 70 units of spent fuel assemblies are contained in the cell.

Page 5, beginning at line 8, please replace the paragraph as follows:

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However, each plate 817 has a through-hole of cooling water passage 816 extending in the axial direction, known as a water zone, and when cooling the spent fuel assemblies, each basket cell and this through-hole are filled with water to moderate neutrons, so that the neutrons may be absorbed efficiently by the plates 817 and the resin 802. The water filling the cooling water passage 816 is discharged after a specified cooling period, and the passage is dried.

Page 7, beginning at line 19, to page 8, line 4, please replace the paragraph as follows:

The absorbing rod according to another aspect of this invention is made of aluminum composite material or aluminum alloy formed by adding powder of boron or boron compound having a neutron absorbing performance to aluminum or aluminum alloy powder. Since the absorbing rod is made of such material, it is not damaged by minor shocks during transportation. As a consequence, it is possible to maintain the neutron absorbing ability even during transport. For example, it is much safer and therefore preferable to an absorbing rod having a structure in which boron powder is filled inside a pipe.

Page 8, beginning at line 23, to page 9, line 8, please replace the paragraph as follows:

The conveying and storing method of spent fuel assemblies according to still another aspect of this invention comprises the step of inserting an absorbing rod group having nearly the same shape as the shape of a columnar control rod for PWR used in reactivity control of core in a reactor, and having a neutron shielding capability, into a control rod guide pipe group including a measuring pipe of spent fuel assemblies for PWR. Further, the spent fuel assemblies for PWR are conveyed and stored in a state in which the absorbing rod group is inserted. Accordingly, the distance between spent fuel assemblies can be shortened.

Page 9, line 20, please replace the text as follows:

Fig. 3 is a plan view of the spent fuel assembly.

Page 9, beginning at line 21, please replace the text as follows:

Fig. 4 is a sectional view taken along line A-A of support lattice.

Page 9, line 23, please replace the text as follows:

Fig. 5 is a diagram showing the structure of a fuel rod.

Page 10, beginning at line 3, please replace the text as follows:

Fig. 8 is a sectional view taken along line B-B of a lower end plate.

Page 10, beginning at line 14, please replace the text as follows:

a14 Fig. 13 is a perspective view showing the structure of a cask for BWR.

Page 11, beginning at line 8, please replace the paragraph as follows:

A spent fuel assembly conforming to the invention is now explained. Fig. 1 is a perspective view showing a general view of a spent fuel assembly for PWR. As shown in Fig. 1, a fuel assembly 1, which is a spent fuel assembly, is formed as a lattice bundling of fuel rods 4, control rod guide pipes 5, and measuring pipes 6, being arranged in a matrix section of 14 x 14. This matrix arrangement is supported by support lattices 7 provided at proper positions in the longitudinal direction of the fuel rods 4, control rod guide pipes 5, and measuring pipes 6. The control rod guide pipes 5 and measuring pipes 6 are supported by an upper nozzle 2 and a lower nozzle 3.

a15

Page 12, beginning at line 12, please replace the paragraph as follows:

Accordingly, as shown in Fig. 2, a plurality of absorbing rods 11 having the same columnar shape as the control rods and measuring rods to be inserted in the control rod guide pipes 5 and measuring pipes 6 and having a neutron absorbing capability are newly prepared, and these absorbing rods are inserted into the control rod guide pipes 5 and measuring pipes 6 of the fuel assembly 1. One end of each absorbing rod 11 is bonded to an end plate 12 which is a rectangular plate member to be inserted inside from the upper opening of the upper nozzle 2, and the other end is formed with a taper, so as to be inserted easily into the control rod guide pipes 5 and measuring pipes 6.

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Page 12, beginning at line 24, to page 13, line 6, please replace the paragraph as follows:

The length of the absorbing rod 11 is long enough to envelop the effective length of the fuel. The radius of the absorbing rod 11 is less then the inside diameter of the control rod guide pipe 5 and measuring pipe 6, and is preferably closer to the inside diameter of the

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a17 Cancel'd

control rod guide pipe 5 and measuring pipe 6 as far as possible, but a certain clearance is required considering the length of about 4 meters.

Page 13, beginning at line 7, please replace the paragraph as follows:

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Fig. 3 is a plan of the fuel assembly 1 shown in Fig. 2. The upper nozzle 2 shown in Fig. 3 corresponds to the matrix arrangement, in which the control rod guide pipes 5 and measuring pipes 6 are disposed. There are a plurality of through-holes for light water passages 21 in the reactor. The absorbing rod 11 is penetrating through the control rod guide pipe 5 and measuring pipe 6.

Page 13, beginning at line 14, please replace the paragraph as follows:

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Fig. 4 is a sectional view taken along line A-A of support lattice 7 of the fuel assembly 1 shown in Fig. 2. The support lattice 7 supports the lattice state of 14 x 14 consisting of fuel rods 4, control rod guide pipes 5 and measuring pipes 6. The absorbing rods 11 penetrate through the control rod guide pipes 5 and measuring pipes 6 of the support lattice 7 shown in Fig. 4.

Page 13, beginning at line 21, to page 14, line 9, please replace the paragraph as follows:

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Therefore, the end plate 12 shown in Fig. 2 is bonded with the absorbing rod 11 so that the absorbing rod 11 may be held in the state inserted in the control rod guide pipe 5 and measuring pipe 6. By using an absorbing rod block 10 formed by bonding a plurality of absorbing rods 11 and end plates 12, a plurality of absorbing rods 11 can be inserted in a batch into the control rod guide pipes 5 and measuring pipes 6. Alternatively, instead of bonding the absorbing rods 11 by using end plates 12 , the absorbing rods 11 may be individually inserted into the control rod guide pipes 5 and measuring pipes 6. However,

A20 cont'd

when conveying the fuel assembly 1 in which the absorbing rods 11 are inserted, it is easier to hold the absorbing rods 11 by using the absorbing rod block 10.

Page 14, beginning at line 10, please replace the paragraph as follows:

A21

Fig. 5 is a front view of the fuel rod 4. In Fig. 5, a plurality of pellets 31 are inserted into a cylindrical clad pipe 33 composed of zirconium alloy, and the pellets 31 are held by a spring 32 inserted in the upper part of the clad pipe 33. This fuel pipe 4 is mainly composed of the spent fuel assembly as mentioned above.

Page 14, beginning at line 16, please replace the paragraph as follows:

A22

The absorbing rod 11 is composed of aluminum composite material or aluminum alloy formed by adding a powder of boron or of a boron compound having a neutron absorbing capability, to a powder of aluminum or of an aluminum alloy, and is designed not to reach the stage of criticality from the inside of the spent fuel assembly.

Page 16, beginning at line 22, to page 17, line 6, please replace the paragraph as follows:

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The following material may be used as powder of aluminum or aluminum alloy. That is, pure aluminum (JIS lxxx) , A1-Cu aluminum compound (JIS 2xxx), A1-Mg aluminum compound (JIS 5xxx), A1-Mg-Si aluminum compound (JIS 6xxx), A1-Zn-Mg aluminum compound (JIS 7xxx), A1-Fe aluminum compound (Fe content between 1 to 10 weight percent). Further, A1-Mn aluminum compound (JIS 3xxx) also may be used. The material to be used may be selected depending upon the required strength, expansion, processing ability, and temperature resistance.

Page 18, beginning at line 12, please replace the paragraph as follows:

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The material mixed in the above-mentioned manner and amount is subjected to mechanical alloying in an Attriter mill. A rotating mill or a vibrating mill may be used

instead of Attriter mill. When subjected to mechanical alloying, aluminum and aluminum compound is crushed by the balls and become flat. Further, boron or boron compound and the third particles ground to still finer size and they uniformly enter into the voids in the aluminum matrix. These flattened particles become particles of normal shape containing aluminum or aluminum compound and the third particles.

Page 18, beginning at line 22, to page 19, line 8, please replace the paragraph as follows:

It is possible to increase the material strength greatly because of the addition of the third particles and subjecting the material to mechanical alloying. It was confirmed with an experiment that the material formed in this manner has about three times higher material strength than the material formed using the ordinary mixers (for example, cross-rotary mixer or V mixer). Further, boron or born compound having high hardness get dispersed finely and uniformly inside the matrix so that the cohesion of boron can be prevented. Further, the squeeze out property thereof can be increased greatly. Accordingly, dice for squeeze out is not so worn-out due to friction.

Page 19, beginning at line 9, please replace the paragraph as follows:

Further, when adding the third particles, the aluminum or aluminum composite powder may be subjected to oxidation thereby creating a oxide layer on the surface of these particles, finely pulverizing this oxide layer due to the mechanical alloying so as to cause the particles to disperse in the matrix. The oxidation of the aluminum or aluminum composite powder may be performed by heating in air. For example, aluminum or aluminum composite powder may be put into a furnace and agitated while being heated. When this process is carried out for a few hours, an oxide layer is formed on the surface of the aluminum or aluminum compound.

Page 19, beginning at line 20, to page 20, line 4, please replace the paragraph as follows:

Thus, the absorbing rods 11 is formed of aluminum composite material or aluminum alloy. Accordingly, it is light in weight, has the ability to shield the neutrons, and the distance between the spent fuel assemblies can be decreased. In other words, if the same number of spent fuel assemblies are to be used, then the cask becomes more light-weight. Any material that has the property to absorb the neutrons may be used instead of aluminum composite material or aluminum alloy. Accordingly, the fuel rod 4 may itself be used instead of the absorbing rod 11.

Page 20, beginning at line 4, please replace the paragraph as follows:

According to the first embodiment, since the absorbing rods 11 having a neutron absorbing capability are inserted into the control rod guide pipes 5 and measuring pipes 6 of spent fuel assemblies, the neutrons can be absorbed by effectively utilizing the space in the control rod guide pipes 5 and measuring pipes 6, and emission of neutrons from the inside of the spent fuel assemblies can be reduced, and therefore the spacing distance for subcriticality between spent fuel assemblies can be shortened. Alternatively, by using the absorbing rod block 10 bonding a plurality of absorbing rods 11 by end plates 12, the absorbing rods 11 can be inserted in a batch form into the control rod guide pipes 5 and measuring pipes 6, so that the working efficiency is enhanced.

Page 20, beginning at line 23, to page 21, line 12, please replace the paragraph as follows:

Fig. 6 is a radial direction sectional view of the cask, which is an improvement of the conventional cask for PWR shown in Fig. 17. The plate 817 shown in Fig. 17 is high in the uranium enrichment factor in the spent fuel assemblies for PWR, is large in uranium charge

amount per unit fuel assembly as compared with the fuel for BWR, and is wide in the sectional area of fuel assembly, and hence the reactivity is high in the system arranging them. Therefore, in order to absorb the neutrons efficiently by moderating the neutrons in cooling process, the cooling water passage 816 is filed with water as a neutron moderator. The spent fuel assemblies in which the absorbing rods 11 explained in the first embodiment are inserted contain neutron absorbing materials in the spent fuel assemblies, and hence the neutrons released outside from the spent fuel assemblies are decreased.

Page 21, beginning at line 13, please replace the paragraph as follows:

As a result, it is possible to shorten the spacing distance for controlling with the subcriticality in cooling of spent fuel assemblies, and hence it does not require cooling water passage 816 in cooling process. Accordingly, the plates 50 for composing the basket 49 of the cask 40 for PWR shown in Fig. 6 do not have a cooling water passage the same as in the basket structure for BWR.

Page 22, beginning at line 6, please replace the paragraph as follows:

In the basket of the same shape as shown in Fig. 17, when the spent fuel assemblies in the first embodiment are accommodated, the emission of neutrons is decreased, and hence the resin thickness can be reduced. As a result, it is possible to reduce the entire size of the cask when accommodating the same number of spent fuel assemblies.

Page 23, beginning at line 1, please replace the paragraph as follows:

A third embodiment is explained below. In the first embodiment, by using the absorbing rod block 10 composed of a plurality of absorbing rods 11, the plurality of absorbing rods 11 are inserted in batch to enhance the working efficiency. The third embodiment is further intended to insert spent fuel assemblies of plural absorbing rods 11 more easily, safely and securely.

Page 23, beginning at line 13, to page 24, line 3, please replace the paragraph as follows:

The upper end plate 61 corresponds to the absorbing rod block 10. The upper end plate 61 and lower end plate 62 are suspended by the suspender 63. Fig. 8 is a sectional view taken along line B-B of the lower end plate 62. The lower end plate 62 has a guide hole 77 for guiding the absorbing rod 11. The guide hole 77 is provided corresponding to the position of the control rod guide pipe 5 and measuring pipe 6. When the upper end plate 61 and lower end plate 62 are suspended by the suspender 63, when stopping still or in the initial state, the leading end of the absorbing rod 11 must be at least inserted into the guide hole 77. The width of the upper end plate 61 and lower end plate 62 in the horizontal direction must be wide enough for allowing to be inserted from the upper opening of the upper nozzle 2, and the width is required to be at least enough for forming the guide hole 77 of the control rod guide pipe 5 and measuring pipe 6.

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Page 29, beginning at line 19, please replace the paragraph as follows:

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A fourth embodiment is explained below. In the second embodiment, it is intended to store the spent fuel assemblies in the first embodiment into the cask. However, the fourth embodiment specifies the method of storing spent fuel assemblies in the storage pool.

Page 30, beginning at line 11, please replace the paragraph as follows:

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Therefore, according to the fourth embodiment, the fuel assemblies 101 can be arranged with a high density, and the number of fuel assemblies 101 to be stored is increased, or the size of the pool 102 can be reduced.

Page 30, beginning at line 15, please replace the paragraph as follows:

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In the first to fourth embodiments, spent fuel assemblies for PWR of 14 x 14 are shown as examples, but are not limited to this example, and it is evident such could be

a36 corrected applicable similarly in other spent fuel assembles for PWR, such as a 17 x 17 or a 15 x 15 arrangement as shown in Fig. 16.

Page 31, beginning at line 4, please replace the paragraph as follows:

According to the absorbing rod of another aspect of the present invention, it is made of aluminum composite material or aluminum alloy formed by adding powder of boron or boron compound having a neutron absorbing performance to aluminum or aluminum alloy powder. Since the absorbing rod is made of such material, it does not become damaged by minor shocks during transportation. As a consequence, it is possible to maintain the neutron absorbing ability even during transport. For example, it is much safer and therefore preferable than an absorbing rod having a structure in which boron powder is filled inside a pipe.

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Page 32, beginning at line 15, to page 33, line 6, please replace the paragraph as follows:

Further, since the equivalent thickness corresponding to the neutron absorbing capability or neutron moderating capability of the plates or square pipes for composing the basket for holding the spent fuel assemblies for PWR in the cask, of the portion corresponding to the sectional area of the absorbing rod inserted in the spent fuel assemblies for PWR, is reduced for the portion of the equivalent sectional area corresponding to the neutron absorbing capability or neutron moderating capability of the absorbing rod inserted in the spent fuel assemblies for PWR, thereby forming a basket shape, the water zones provided in the basket for PWR high in uranium enrichment factor, in particular, can be further reduced in height, or the basket may be formed even by eliminating the water zones, and therefore the shape of the basket for PWR high in uranium enrichment factor may be formed

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